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Hematological Parameters During Late Gestation in Dairy Cows Raised in Tiaret, Algeria

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Abstract: The period of transition between late pregnancy and early lactation presents an important metabolic challenge to the high-yielding dairy cows. They need, especially for the high milk yield, more nutrients and energy supply than other animals. The aim of this study was to complete the picture of dynamics of hematological parameters in dairy cows from in the dry period, giving useful information about the guidelines for the management strategies during different physiological phases. The study was carried out on twenty Holstein Friesian clinically healthy dairy cows, in good nutritional condition. All the experimental subjects were selected on the basis of their pregnancy and lactation status, so blood samples were collected before the expected parturition (Late gestation). On each serum sample the number of red blood cells (RBC), hemoglobin concentration (Hb), hematocrit (PCV), average volume of red blood cells in the blood (MCV) and total number of leukocytes (WBC), mean corpuscular haemoglobin (MCH) mean corpuscular hemoglobin concentration (MCHC) and platelets number were determined. Our results are in concordance with previous reports for the majority of parameters. Information provided in this paper, advance the continuous investigation in animal welfare and can be a useful tool in managing and preventing the deficiencies typical of high production ruminants.

Key words: Hematological Parameters · Dry Period · Dairy Cows · Reproduction

INTRODUCTION

It is well known that hematological parameters are influenced by many factors as the breed, sex, age, reproductive status, fitness and training levels, exercise, feeding, circadian variations, degree of excitement and health state [1-4].

The transition period from 3 wk before to 3 wk after calving presents enormous physiological challenges for the dairy cow. It is a period that is affected by metabolic stressors, major changes in endocrine status and altered immune function, which together result in an increased risk of diseases including hypocalcaemia, ketosis, hepatic lipidosis, laminitis, abomasal displacement, mastitis, retained placenta and metritis [5, 6].

The red and white blood cells counts, packed cell volume, hemoglobin concentration and segmented neutrophiles were increased after the second period of pregnancy (days 91-180 PP) and decreased in the last period (days 180 onward), while glucose concentration remained unchanged during whole gestation in cows [7].

Therefore, this study was aimed at examining hematological parameters in healthy dairy cows during the third period of pregnancy to establish reference values during gestation, under usual handling conditions.

MATERIALS AND METHODS

The present study was conducted on 20 Prim Holstein dairy cows raised in tow farms, during 2015 winter in Tiaret, Algeria. All cows were subjected to a general clinical examination before taking blood samples. All animals were free of disease. The reproductive statute of each cow was recorded according to its recorded history and clinical investigation after rectal examination and the ultrasonography. All cows used in this study were in the dry period.

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Table 1: Hematological parameters for prim Holstein dairy cows in the dry periode.

Parameters	N	Mean	Min	Max	SD
Total leukocyte counts (U/ml)	20	9319,00	3100	28000	4828,28
Total erythrocyte counts (X 10^{12}/L)	20	5,86	4,87	6,68	0,60
Haemoglobin (g/dL)	20	10,68	8,6	12,7	1,07
Packed cell volume (%)	20	28,29	23,1	33,5	3,07
MCV (fl)	20	48,38	44,7	53	2,52
MCH (pg)	20	18,23	16,96	19,6	0,88
MCHC (g/dl)	20	37,76	34,8	39,2	1,07
Platelet (U/ml)	20	316800,00	159000	429000	79985,26
Neutr %	20	39,33	0	76,4	14,77
Eosinop %	20	6,31	0	14	4,45
Baso %	20	6,16	0	50	14,95
Monoc %	20	11,63	0	21	5,35
Lympho %	20	34,75	8,7	52	11,62

Jugular blood samples were collected via EDTA vacutainer tubes from each cow early in the morning before feeding. The blood samples were brought to the biochemical laboratory within two hours for analysis. In the whole blood samples the number of red blood cells (RBC), hemoglobin concentration (Hb), hematocrit (PCV), average volume of red blood cells in the blood (MCV) and total number of leukocytes (WBC), mean corpuscular haemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and platelets number were determined using an automatic cell counter. For each parameter, mean and standard deviation values were determined.

RESULTS AND DISCUSSION

In this study all the values was in concordance with authors reports, all values are noted in the Table (1).

Nutritional deficiencies, metabolic disorder and changes during gestation can be detected by analysis and monitoring of blood and other body fluids (22, 16). However hematological values indicate the health status of the dam and any deviation from the normal values in the late pregnancy may reflect the health status of the neonate (23).

These data are in coincidence with the previous reports in buffaloes who did not found any hematological profile differences during early and late lactation periods [8, 9]. This fact is in disagreement with the findings in African Dwarf goats [10] and Sahiwal cows [7].

Also, Sahiwal cows showed during last trimester of pregnancy (pregnant dry cows) values of PCV 28.4±0.61 to 31.4±0.50%, Hb 9.7±0.30 to 11.1±0.30 g/dl and RBC count 4.7±0.41 to 7.0±0.42×10^{12}/L [11] these values coincide with ours. However, low Hb concentration in late lactation and pregnancy was also mentioned [12].

High MCV and MCH and low MCHC in non-pregnant dry cows was previously reported [13] compared to our results shown in the Table 1. [11] reported WBC count of 6.8±0.28 to 8.3±0.29 10^3/µl, lymphocytes 55.5±1.96 to 65.3±2.49%, monocytes 3.50±0.87 to 3.90±0.81%, neutrophils 21.1±1.12 to 30.0±3.69%, eosinophils 5.50±1.66 to 8.00±0.71% and basophils 0.20±0.25 to 0.40±0.18% and ESR 5.9±0.40 to 17.1±1.89 mm/24hr in Sahiwal cows during last trimester of pregnancy (pregnant dry cows) on the other hand, the differences of monocytes, neutrophils, eosinophils and basophils between all the groups were statistically non-significant. Most of these values are closely related to the present study.

High leukocytic count during different gestation periods was previously observed [14]. Discrepancies in values for various haematological parameters between our findings and previous studies may be explained by differences in sampling interval, used methods, numbers of cows sampled and/or degree of metabolic disturbances. Moreover, genetic differences between cows and environmental conditions might have a role for differences was sited but not observed in our results [15]. In the present study, the reasons for immune suppression in pregnant cows are not fully known, but several factors such as management, feeding and changes in hormonal levels may be involved [16]. suppression of leukocyte functions in dairy cows has been associated with negative energy balance around calving and in early lactation [16]. Sometimes blood leukocyte numbers and their functions change considerably around parturition, resulting in suppression of the immune response from a few weeks before to a few weeks after calving [15]. Lymphocytes decrease around parturition mainly due to reduced lymphocyte proliferation [17].

In this study it was clear that hematological parameters during late pregnancy in dairy cows raised in Tiaret, Algeria, are changing with the reproductive statues as well as reported in other dairy cattle races.

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